

## ***A2CC Midterm Review Sheet***

***Midterm Exam: Wednesday, January 25<sup>th</sup> 2:00 – 3:30 in the Cafeteria***

### ***Exam Format:***

***Part 1: 17 multiple choice questions (no partial credit)***

***Part 2: 9 free response questions (partial credit)***

This review sheet should not be your only study guide. Please be sure to go over your old exams, homework and notes to fully prepare for the midterm.

### ***Exponential Equations***

1. Solve each of the following:

(a)  $8^x = 2^{x+6}$

(b)  $4^{2x-3} = \frac{1}{16}$

(c)  $x^{\frac{3}{2}} = 64$

(d)  $125^{-2x} = 25^{x+1}$

(e)  $a^{\frac{3}{5}} - 2 = 25$

(f)  $3(2m+3)^{\frac{2}{3}} + 2 = 77$

### ***Rational Expressions***

2. Simplify:  $\frac{6x^2 + 12x}{x^3 - 5x^2 - 14x}$

3. Simplify:  $\frac{x^2 - 2x - 24}{x^2 - 16}$

4. Find the value(s) of  $x$  for which the fraction is undefined:

(a)  $\frac{12}{x-2}$

(b)  $\frac{23}{6x}$

(c)  $\frac{x^2 - 25}{x^2 + 6x + 8}$

In 5 – 8, perform the indicated operations and express answers in simplest form.

5.  $\frac{3}{x+4} + \frac{2}{x}$

$$6. \frac{5x^2 - 5x - 60}{4x^2 - x} \cdot \frac{x^2 - 3x - 10}{x - 4} \div \frac{x^2 - 2x - 15}{8x^2 - 2x}$$

$$7. \frac{2x^2 - 16}{x^2 - 4} - \frac{x + 4}{x + 2}$$

$$8. \frac{x - 1}{x^2 + 3x + 2} + \frac{x}{x + 1}$$

$$9. \text{ Solve for } x: \frac{1}{6x} + \frac{8}{x} = \frac{x}{6}$$

$$10. \text{ Solve for } x: \frac{4n + 3}{n - 6} + \frac{n - 4}{6 - n} = \frac{44}{2n - 12}$$

$$11. \text{ Simplify each: (a) } \frac{1 + \frac{2}{a}}{\frac{2}{a} - \frac{a}{2}} \quad (b) \frac{x - \frac{9}{x}}{1 + \frac{3}{x}} \quad (c) \frac{1 - \frac{1}{16x^2}}{1 - \frac{1}{4x}} \quad (d) \frac{\frac{c}{2} - \frac{2}{c}}{1 + \frac{c}{2}}$$

### ***Radicals***

$$12. \text{ Simplify: } \frac{\sqrt{900}}{\sqrt{20}}$$

$$13. 2\sqrt{48} + 2\sqrt{12}$$

$$14. \sqrt{49a^2b^4} - \sqrt{16a^2b^4} + \sqrt{8a^2c}$$

$$15. \text{ Simplify: } \frac{3}{6 - 5\sqrt{2}}$$

$$16. \text{ Solve: } \sqrt{3x + 6} - 2 = 7$$

$$17. \text{ Solve: } 2\sqrt{2x - 6} + 8 = 4$$

### ***Complex Numbers***

$$18. \text{ Simplify: } \sqrt{-45x^4y^7}$$

$$19. 5\sqrt{-18} + \sqrt{-50} - \sqrt{-75}$$

$$20. \text{ Find the value of } i^{53}$$

$$21. (2 - 5i)(6 + 7i)$$

## ***Factoring***

22. Factor each of the following completely.

(a)  $3x^2 + 5x - 2$

(b)  $16x^4 - y^8$

(c)  $2x^2 - 10x - 28$

(d)  $x^3 + 3x^2 - 4x - 12$

(e)  $8x^3 + 125$

## **Quadratics**

23. Find all roots of the equation:  $2x^2 - 3x = 2$

24. Solve by completing the square:  $3x^2 = 6x - 15$

25. Describe the roots of the following quadratic equations:

(a)  $2x^2 - 3x + 4 = 0$

(b)  $\frac{1}{3}x^2 - x = 6$

(c)  $x^2 - 6x = -9$

## ***Inequalities***

Solve each inequality and express the solution set in set builder notation.

26.  $x^2 - x > 6$

27.  $\frac{1}{x} < 1$

Solve each inequality and express the solution set in interval notation.

27.  $x^2 - 7x \leq x$

28.  $\frac{9}{x-4} \geq -6$

## ***Solving Higher Degree Polynomials***

Solve each of the following.

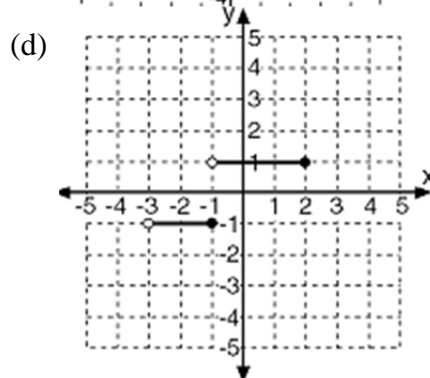
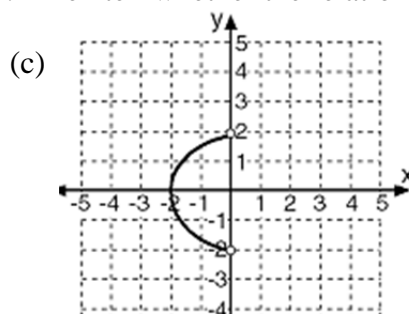
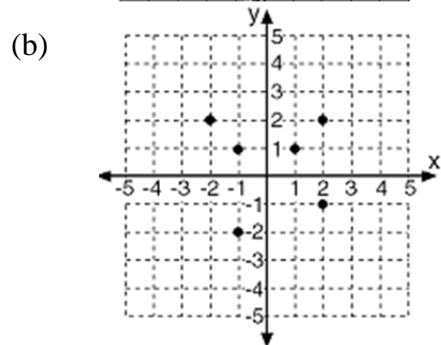
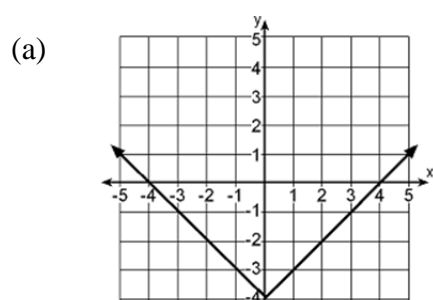
29.  $x^3 + 3x^2 - 9x = 27$

30.  $x^4 - 8x^2 + 16 = 0$

31.  $(x^2 + 5x - 7)(x + 3) = 0$

## Functions

32. Give the domain and range for each relation. Then tell whether the relation is a function.



33. Given  $f(x) = 4 - x^2$ , evaluate  $f(-2)$ .

In 34 – 39, determine whether or not the following relations are functions. *If they are functions:*

(a) determine whether or not they are one – to – one

34.  $3x = -10 + 4y$

35.  $x = y^2 - 2y - 24$

36.  $x = 5$

37.  $y = 10$

38.  $y = |2x - 3|$

39.  $y = x^2 - x - 6$

40. Determine the domain of each of the following functions.

(a)  $f(x) = \frac{x+2}{x^2 - x - 20}$

(b)  $g(x) = \sqrt{2x-5}$

(c)  $h(x) = \frac{1}{\sqrt{3x-15}}$

41. Given  $f(x) = 2\sqrt{x+3}$  and  $g(x) = -3x + 1$ , find each value:

(a)  $f(g(1))$

(b)  $g(f(1))$

(c)  $g(f(6))$

42. Given  $f(x) = 4x + 3$  and  $g(x) = \frac{x}{x+3}$ , find:

(a)  $f(g(x))$

(b)  $g(f(x))$

43. Given  $h(x) = -x^2 - 2$  and domain  $-3 \leq x \leq 3$ , find the largest element in the range.

44. Given  $f(x) = \frac{7-8x}{3}$ . Is  $f(x)$  one to one? Explain your answer.

45. Determine the domain and range of  $f(x) = \{(1,2), (3,4), (5,6), (7,8)\}$ . Find the inverse of  $f(x)$ . Is  $f(x)$  one to one?

### ***Laws of Exponents***

46. Simplify each expression and write the answer using only positive exponents:

(a)  $\frac{2x^{-2}y^{-2}}{4y^{-5}}$

(b)  $\frac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}}$

47. Rewrite the expression  $x^{\frac{2}{5}}$  as an equivalent expression in radical form.

### ***Polynomials***

48. Write  $\frac{2x^3 - x^2 - 6x - 1}{x+1}$  in the form  $q(x) + \frac{r}{x+1}$ , where  $q(x)$  is a polynomial and  $r$  is a constant.

49. Is  $(x+2)$  a factor of  $3x^4 + 7x^3 + 3x^2 - x - 4$ . Explain your answer.

50. What is the remainder when  $6x^5 + 21x^4 - 14x^3 - 8x^2 + x - 6$  is divided by  $(x+4)$ ?

51. What is the complete factorization of  $4x^4 - x^3 - 4x^2 + 1x$ ?

52. What is the complete solution set of  $P(x) = x^6 + 2x^4 - 16x^2 - 32$  ?

53. Sketch  $f(x) = (x+3)^2(x-5)$  (be sure to label all x and y intercepts)

### ***Circles***

54. Determine the center and radius of the circle whose equation is  $x^2 + y^2 + 8x + 25 = 6y + 15$